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Alena (Aztekoraphidia) horstaspoecki nov. spec. – a new snakefly from Mexico (Raphidioptera, Raphidiidae)[1]

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Abstract: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., a new species of snakefly, from Hidalgo state, central Mexico, is described and illustrated. With this discovery the number of snakefly species recorded from Mexico increases to 14. Morphological criteria of the hypovalva reveal diagnostic characters for the differentiation from all other species of *Alena*, and support arguments for the hypothesis of a hypovalva-paramere-complex.

Resumen: Una especie nueva de rafidióptero, *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., es diagnosticada, descrita e ilustrada con ejemplares del estado de Hidalgo, en el centro de México. Esta es la décimocuarta especie de rafidióptero registrada en México. Criterios morfológicos de la hipovalva revelan caracteres diagnósticos para la separación de todas las demás especies de *Alena*, apoyando además la hipótesis de un complejo hipovalva-parámero.

Key words: Raphidioptera, *Alena* (*Aztekoraphidia*), new species, Mexico.

Introduction

The Raphidioptera is a small order which comprises two families, the Raphidiidae with 186 described valid species, and the Inocelliidae with 21. Raphidioptera together with its adelphotaxon Megaloptera + Neuroptera constitute the Neuropterida, a superorder at the base of the Holometabola. The Raphidioptera is distributed throughout the Holarctic region, except for the northern and eastern parts of North America, the southernmost records being from high altitudes at the Mexican-Guatemalan border, northern Africa, northern India, Myanmar, northern Thailand and Taiwan (H. ASPÖCK, U. ASPÖCK & RAUSCH 1991). In Mexico, hitherto 13 species have been recorded, 10 Raphidiidae, and three Inocelliidae. All available information on Mexican snake flies has been summarized in U. ASPÖCK & H. ASPÖCK (1996). The discovery of a new species in this part of the earth is not at all surprising, nevertheless it is of great significance for several reasons: 1) for a relict taxon comprising altogether 207 extant described species the discovery of species number 208 is a spectacular event, 2) the new species is from a region of Mexico where so far no raphidiopterans have been reported, 3) it documents once more the importance of the Mexican region as an evolutionary centre of these living fossils, and 4) a remarkable anatomical character of the hypovalva induces a new interpretation of this structure.

Alena (Aztekoraphidia) horstaspoecki nov. spec.

Derivatio nominis: The name of this new species is a grateful homage to Horst Aspöck, Vienna, Austria, for his extensive contribution to neuropterology, on the occasion of his 65th birthday.

Material studied: Holotype, ♂: Mexico, Hidalgo, Huasca, Rancho Sta. Elena, Manantial de las Vigas, 20°07'53,4"N/ 98°31'38,5"W, 2500 m, 26.III.-9.IV.2003, Menchaca, Contreras; Malaise 1; Paratypes: 1 ♀: Same data as holotype, but 9.-23.IV.; 1 ♀: Same locality as holotype, 26.II.03-26.III.03, Malaise 2; (♂ holotype and one ♀ paratype in coll. Centro de Investigaciones Biologicas, UAEH, Pachuca, Mexico, one ♀ paratype in coll. Naturhistorisches Museum Wien).

Morphology (Fig. 1-11): A small tender species, length of forewing of the ♂ 8 mm, of the ♀ 8,2-9 mm. Head elongate rectangular, black with brownish pattern, with a fine sculpture, clypeus brownish, with a group of bristles; labrum brownish with yellow margins. Antennae: scapus brown, pedicellus and basal flagellomeres yellowish, otherwise brown. Pronotum: in front and laterally with broad yellow margins, anterior part brownish, longer caudal part dark brown, almost black, with ochre pattern. Legs: first coxae basally brown, distally yellow,

[1] Dedicated to Horst Aspöck on the occasion of his 65th birthday, gratefully and in all the excitement of 40 years fascinating collaboration on Neuropterida, and of continuous stimulating scientific discussions. Ulrike Aspöck.
Dedicated to Prof. Horst Aspöck, gladly and as a great honour, on the occasion of his 65th birthday. Atilano Contreras-Ramos.

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Fig. 1: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., holotype, ♂, head and thorax, lateral.

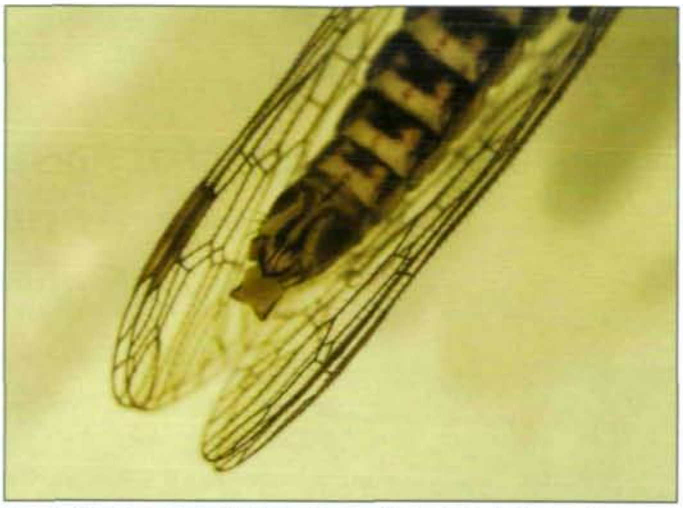


Fig. 2: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., holotype, ♂, abdomen and wings, ventral.

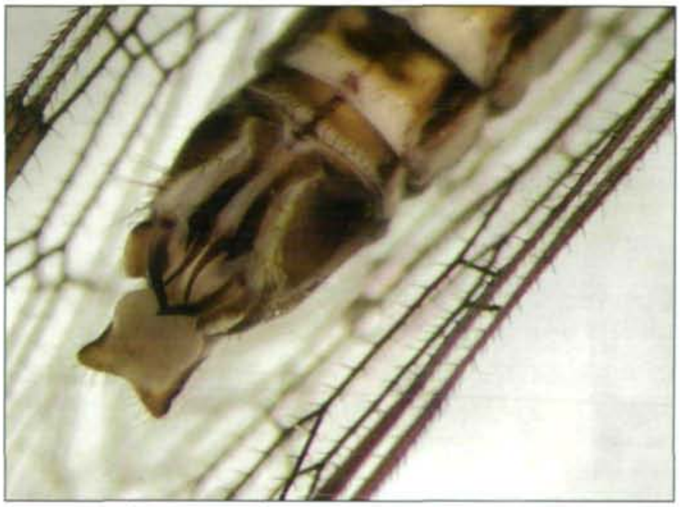


Fig. 3: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., holotype, ♂, genital segments, ventral.



Fig. 4: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., holotype, ♂, genital segments, lateral.

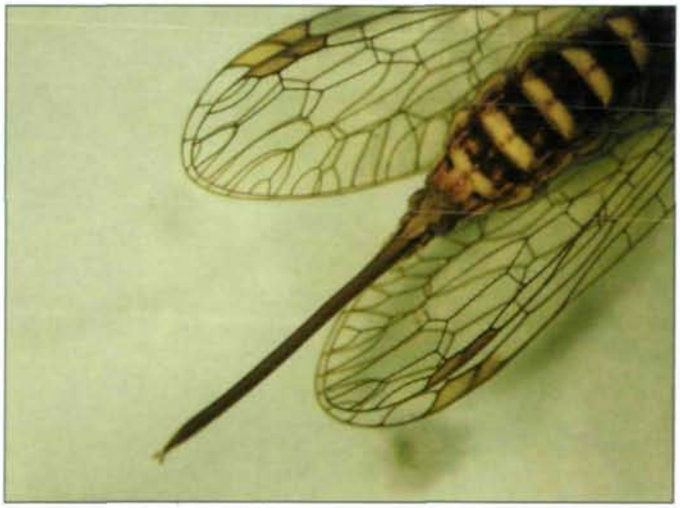


Fig. 5: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., paratype, ♀, abdomen and wings, ventral.

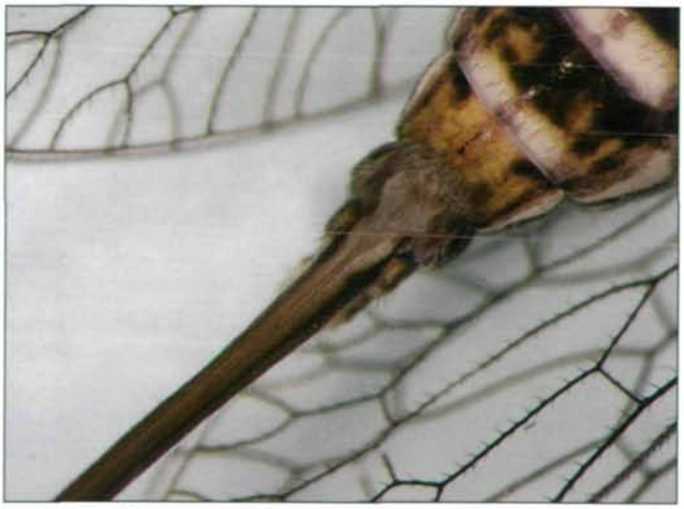


Fig. 6: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., paratype, ♀, genital segments, ventral.

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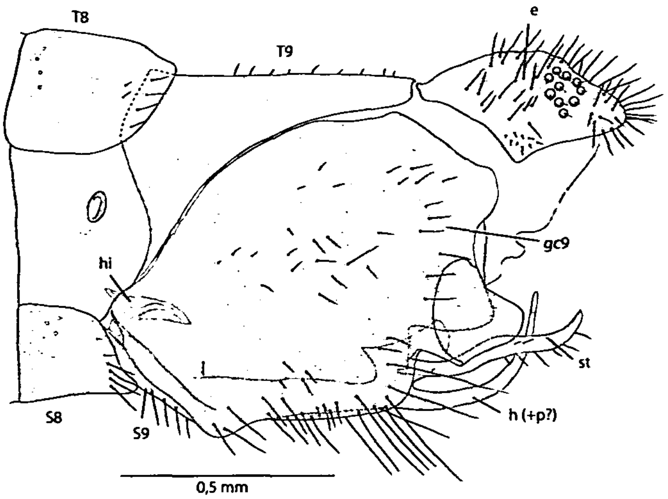


Fig. 7: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., holotype, ♂, genital segments, lateral. e = ectoproct, gc9 = 9th gonocoxite, h = 9th gonapophysis (hypovalva), h + p? = amalgamation of hypovalva and parameres, hi = hypandrium internum, p ? = 10th gonocoxite + 10th gonapophysis ? (paramere?), st = stylus.

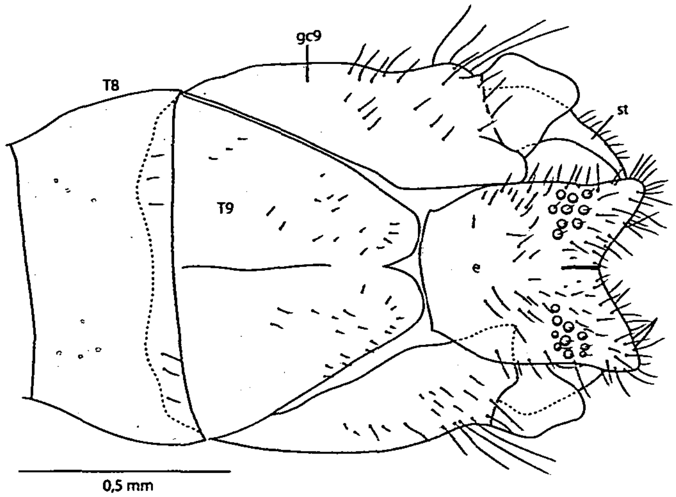


Fig. 8: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., holotype, ♂, genital segments, dorsal. Abbreviations as in fig. 7.

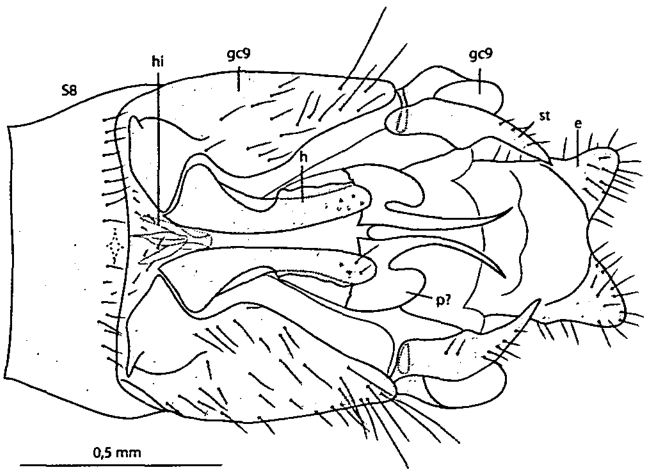


Fig. 9: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., holotype, ♂, genital segments, ventral. Abbreviations as in fig. 7.

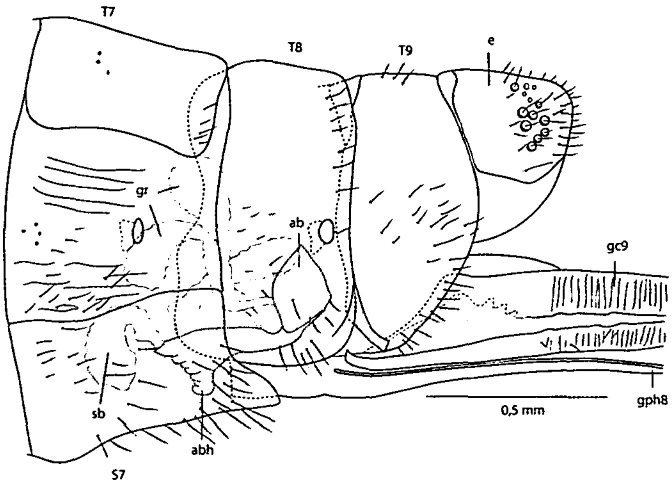


Fig. 10: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., paratypus, ♀, genital segments, lateral. ab = atrium bursae, abh = „horn" of atrium bursae, e = ectoproct, gc9 = 9th gonocoxites, gph8 = 8th gonapophyses, gr = glandulae receptaculi, rs = receptaculum seminis, sb = sacculus bursae.

second and third coxae brown; tarsalia 3-5 brown, legs otherwise yellowish. Wings: membrane hyaline, venation predominantly brown, basal half of C, basal R and Cu yellowish; basal part of Ma in hind wing as a longitudinal vein. Pterostigma yellow, above the distal half of the first pterostigmal cell, with one vein crossing, and with apical vein. Abdomen: tergites speckled brownish; sternites anteriorly black, with two yellow spots in female, but two large yellow windows in male; caudally yellow, medially with a brownish deltoid patch; pleural region brownish-yellowish.

♂ genital segments (Fig. 3-4, 7-9): Sternite of segment 8 only slightly shorter than tergite; tergite 9 trapeziform; gonocoxites 9 forming huge plates with a blunt short, yellowish-whitish, only proximally and basally brownish apex; styli slim; sternite 8 rather indistinct; hypovalva paired, with broad basal rods, dorsally curved

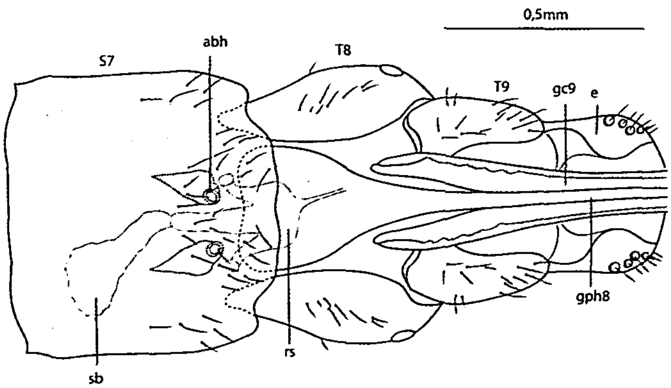
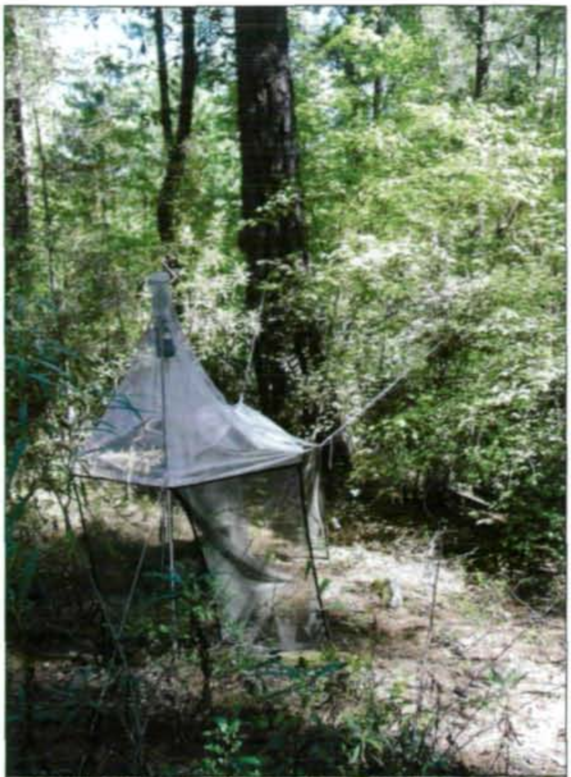


Fig. 11: *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec., paratype, ♀, genital segments, ventral.

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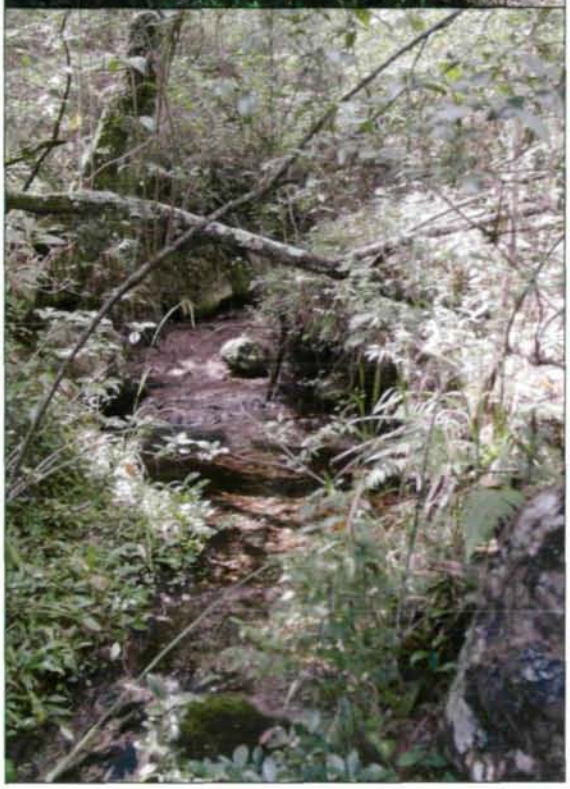


Fig. 12 and 13: Type locality of *Alena* (*Aztekoraphidia*) *horstaspoecki* nov. spec.

apices, and a pair of strongly sclerotized lateral plates; ectoproct with distinct trichobothria; hypandrium internum inconspicuous.

♀ genital segments (Fig. 5, 6, 10, 11): Caudal margin of sternite 7 convex with weak median incision, spiraculum 7 free; tergite 8 inconspicuous, not reaching ventral part of the segment. Atrium bursae ventrally with paired „horns", joined to a complex together with the receptaculum seminis, which is, however, still discernible; sacculus bursae and a pair of glandulae receptaculi skinny and hose-shaped, apically club-like enlarged.

Differentiation: According to the morphology of the ninth gonocoxites of the male *A. horstaspoecki* nov. spec. belongs to the species-group of the subgenus *Aztekoraphidia*, which is constituted by *A. caudata* (NAVÁS 1914), *A. minuta* (BANKS 1903), *A. australis* (BANKS 1895), *A. tenochtitlana* U. ASPÖCK & H. ASPÖCK 1978, *A. infundibulata* U. ASPÖCK & H. ASPÖCK & RAUSCH 1994, and *A. schremmeri* U. ASPÖCK & H. ASPÖCK & RAUSCH 1994, without being closely related to any of them. It may be distinguished from all other species of the subgenus *Aztekoraphidia*, but also of the genus *Alena*, by the huge and heavily sclerotized lateral plates of the hypovalva, by the blunt yellowish-whitish apex of the ninth gonocoxites in the ♂. The identification of the ♀ seems to be more difficult; the enlargement of the basal plate of the gonapophyses and the „horns" of the atrium bursae complex are only visible after maceration in KOH. Whether the remarkable bristles on the clypeus and the yellow colour of the ovipositor are reliable characters for a safe identification can not yet be decided without having more material of all other species of the genus at hand.

Habitat (Fig. 12, 13): The type locality consists of two sites, one adjacent to a first order stream close to its origin (Malaise 1), and a second one at about 20 meters from the stream into the forest in a fairly open area (Malaise 2). The vegetation consists of a pristine oak-pine forest at the base of a mountainous area. Both Malaise traps were maintained operating continuously for one year. However, the three snakefly specimens on which this paper is based were the only ones collected throughout the sampling period.

Almost nothing is known on the biology of the new species, its discovery in a pine-oak forest may, however, lead to the conclusion that the larvae are corticolous, as are all *Alena* species whose larvae are known (H. ASPÖCK 2002).

Distribution (Map 1): So far *A. horstaspoecki* is known from the type locality only, and most probably it is another endemic species of the genus, which now comprises seven species endemic to Mexico, and, in addition, *A. distincta* (BANKS 1911) and *A. minuta* (BANKS 1903), the only species with a larger distribution area north of Mexico.

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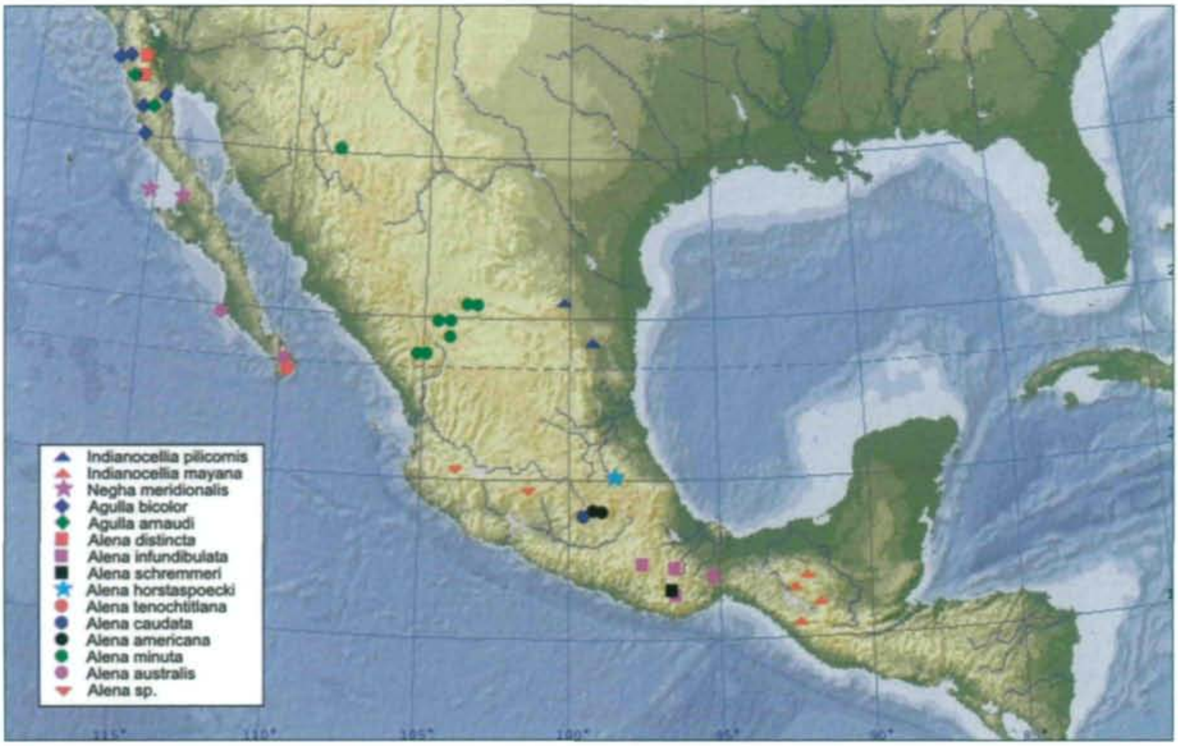


Fig. 14: Records of Raphidoptera in Mexico. For exact data of localities see in H. Aspöck, Aspöck U. & Rausch (1991), U. Aspöck (1974, 1975, 1988), U. Aspöck & H. Aspöck (1970, 1976, 1978, 1996, and U. Aspöck, Aspöck H. & Rausch (1992, 1994a, 1994b).

Discussion

The anatomy of the raphidiopteran hypovalva, which has been interpreted as the gonapophyses of segment 9 (U. Aspöck 2002), deserves some further considerations. In the family Raphidiidae the hypovalva is a paired or unpaired sclerite, closing the male terminalia ventrally. The family Inocelliidae lacks a comparable hypovalva, but the ninth gonapophyses are still to be found as the so called pseudostyli in some species. The hypovalva may be of very different shape, and at any rate it is of enormous taxonomic and systematic importance. Based on considerations turned over already long ago the hitherto unpublished hypothesis of the composed nature of the hypovalva of certain Raphidiidae is corroborated by male genital characters of the new species. This is particularly obvious in species of the Nearctic subgenus *Aztekoraphidia* U. Aspöck & H. Aspöck 1970 of the genus *Alena* Navás 1916, but probably also of the Mediterranean genus *Hispanoraphidia* H. Aspöck & U. Aspöck 1968. The basal parts and the apical parts of the paired rods of the hypovalva show traces of a disruption, in a way or the other, either by skinny parts, or by special structures, e.g. *Alena* (*Aztekoraphidia*) *caudata*, *A. minuta*, *A. australis* (Banks 1895), or *A. tenochtitlana* (U. Aspöck & H. Aspöck 1978). In *A. horstaspoecki* the apical hooks and the lateral plates of the hypovalva appear as if they were amalgamated structures, and resemble certain internal sclerites known from Palaearctic species: e.g. *Atlantoraphidia maculicollis* (Stephens 1836) (see H. Aspöck, U. Aspöck & Rausch 1991, Fig. 1036, 1037), *Italoraphidia solariana* (Navás 1928) (see H. Aspöck, U. Aspöck & Rausch 1991, Fig. 1069, 1070). The homologisation of these sclerites (U. Aspöck 2002) as parameres (tenth gonocoxites + tenth gonapohyses) or, alternatively, as the gonarcus (eleventh gonocoxites), has always been problematic. On the other hand, there are similar structures, accompanying the hypovalva laterally, partly externally and more basally, which have been identified as parameres, e.g. in the Palaearctic *Raphidia* (*R.*) *ophiopsis* Linnaeus 1758, or in the Nearctic *Agulla* (*Glavia*) *modesta* Carpenter 1936 (see H. Aspöck, U. Aspöck & Rausch 1991, Fig. 771-810 and Fig. 1794-1845) respectively.

Under these aspects the study of the new species offers the following hypotheses:

1) The apical part of the hypovalva, comprising the lateral plates and the curved hooks are interpreted as the amalgamated parameres (gonocoxites + gonapophyses of segment 10).

2) In other species of *Aztekoraphidia* – although not evident at a first glance, as the lateral plates are missing – the hypovalva too seems to be of composed nature, and the apices represent the amalgamated parameres.

2) If the hypothesis of amalgamation of parameres and hypovalva holds, identical phenomena in Palaearctic species could be of phylogenetic relevance, if they are synapomorphic. The genera *Harraphidia* Steinmann 1963 and *Hispanoraphidia* H. Aspöck & U. Aspöck 1968

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have to be considered under this aspect, as both lack parameres, and the hypovalva might include the parameres in these (and perhaps additional) taxa. Moreover, this could be also of biogeographic relevance for an understanding of the origin of the Nearctic Raphidiidae.

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Zusammenfassung

Alena (*Aztekoraphidia*) *horstaspoecki* nov. spec., eine neue Kamelhalsfliege aus Hidalgo, Zentralmexiko, wird beschrieben und abgebildet. Mit dieser Neuentdeckung erhöht sich die Zahl der bisher aus Mexiko nachgewiesenen Spezies der Ordnung Raphidioptera auf 14. Morphologische Kriterien der Hypovalva bieten nicht nur diagnostische Merkmale zur Abgrenzung gegenüber allen anderen *Alena*-Arten, sondern liefern auch Argumente zur Hypothese eines Hypovalva-Parameren-Komplexes.

References

ASPÖCK H. (2002): The biology of Raphidioptera: a review of present knowledge. — In: SZIRÁKI G. (ed.), Neuropterology 2000. Proceedings of the Seventh International Symposium on Neuropterology, 6-9 August, 2000, Budapest, Hungary. Acta Zoologica Academie Scientiarum Hungaricae **48**, supplement 2: 35-50.

ASPÖCK H., ASPÖCK U. & H. RAUSCH (1991): Die Raphidiopteren der Erde. Eine monographische Darstellung der Systematik, Taxonomie, Biologie, Ökologie und Chorologie der rezenten Raphidiopteren der Erde, mit einer zusammenfassenden Übersicht der fossilen Raphidiopteren (Insecta: Neuropteroidea). — 2 Bde: 730 pp; 550 pp. Goecke und Evers, Krefeld.

ASPÖCK U. (1974): Die Raphidiopteren der Nearktis (Insecta, Neuropteroidea). — Diss. Univ. Wien 1974: 2 Bde; Textband: 238 pp., Abbildungsband: 771 Abb., 20 Karten.

ASPÖCK U. (1975): The present state of knowledge on the Raphidioptera of America (Insecta, Neuropteroidea). — Polskie Pismo ent. **45**: 537-546.

ASPÖCK U. (1988): *Negha meridionalis* n.sp. - eine neue Inocelliiden-Spezies aus Südkalifornien (USA) und Baja California (Mexiko) (Neuropteroidea: Raphidioptera: Inocelliidae). — Z. ArbGem. öst. Ent. **39**: 107-112.

ASPÖCK U. (2002): Male Genital Sclerites of Neuropterida: an Attempt at Homologisation (Insecta: Holometabola). — Zoologischer Anzeiger **241**: 161-171.

ASPÖCK U. & H. ASPÖCK (1970): Untersuchungen über die Raphidiopteren Mexikos (Insecta, Neuropteroidea). — Polskie Pismo ent. **40**: 705-725.

ASPÖCK U. & H. ASPÖCK (1976): Zur Taxonomie und Systematik von *Raphidia* (*Aliaberaphidia*) *australis* BANKS (Ins., Neur., Neuroptera). — Ent. Ber., Amst. **36**: 137-139.

ASPÖCK U. & H. ASPÖCK (1978): *Raphidia* (*Aliaberaphidia*) *tenochtitlana* n.sp. - eine neue Raphidiiden-Spezies aus Baja California (Mexiko) (Neuropteroida, Raphidioptera). — Z. ArbGem. öst. Ent. **30**: 21-24.

ASPÖCK U. & H. ASPÖCK (1996): Raphidioptera. — In: BOUSQUETS J.E.L., ALDRETE A.N.G. & E.G. SORIANO (eds), Biodiversidad, Taxonomia y Biogeografia de Artrópodos de México: Hacia una sintesis de su conocimiento **19**: 277-286, D.R. Universidad nacional Autón. México.

ASPÖCK U., ASPÖCK H. & H. RAUSCH (1992): Rezente Südgrenzen der Ordnung Raphidioptera in Amerika (Insecta: Neuropteroidea). — Entomol. Gener. **17**: 169-184.

ASPÖCK U., ASPÖCK H. & H. RAUSCH (1994a): Neue Arten der Familie Raphidiidae aus Mexiko und Nachweis einer Spermatophore in der Ordnung Raphidioptera (Insecta: Neuropteroidea). —Entomol. Gener. **18**: 145-163.

ASPÖCK U., ASPÖCK H. & H. RAUSCH (1994b): *Alena* (*Mexicoraphidia*) *americana* (CARPENTER, 1958): Taxonomie, Systematik, Ökologie und Chorologie (Neuropteroidea: Raphidioptera: Raphidiidae). — Z. ArbGem. öst. Ent. **46**: 131-139.

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